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## **Assessment of nutritional status and adequacy of fiber intake in a group of obese children and adolescents**

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**Abstract**---Background: Childhood obesity is one of the most serious public health challenges of the 21st century. Its prevalence has increased at an alarming rate according to recent WHO reports. Some studies suggest this increase to changes in diet patterns with the shift to a processed low-fiber diet. Dietary fiber has shown different protective health benefits against obesity and its comorbidities. Current dietary fiber intake status in obese children and adolescents is understudied. Aim of the work: to assess the adequacy of fiber intake in obese children and adolescents. Methods: A observation of a group of obese pediatric patients. All included patients were subjected to detailed medical history and clinical examination obtained from interviews with them or their medical records with special emphasis on anthropometric measures in form of weight, height and waist circumference, age of diagnosis, dietary intake, lifestyle, drugs, and possible complications. Dietary assessment through 24 h recall from all participants with an analysis of fiber according to 2nd Edition food composition tables for Egypt of National Institute of Nutrition Results: obese children and adolescents in the current study consumed less than 25% of their daily required intake. The percentage of the adequacy of fiber intake was only about 13.87% (11.5% – 21.68%) of

the daily required intake in the study group. While fiber density (adequacy of fiber /1000kcal) was only 16.6% (11.54% – 24.46%) of daily required intake in the study group. Conclusion: fiber intakes in obese children and adolescents were far below daily recommended levels.

**Keywords**---dietary fiber, obesity, fiber density, children.

## **Introduction**

The rising incidence of obesity in both developed and developing countries and its early onset in pediatric age groups make it a critical global health issue (WHO, 2016). Over the past 40 years, dietary fiber has been advocated as playing a critical role in preventing and treating overweight, obesity, and related health problems (Lin et al., 2015). According to the Institute of Medicine (US) (2006), the daily recommended intake for the general population is 14 grams of fiber per 1000 calories, or around 19 to 25 grams for females and 19 to 38 grams for males. There are no precise guidelines on the types of DF that should be consumed, although it is advised that whole grains make up at least half of all grain consumption (Evert et al., 2014). When compared to a high-fiber diet that includes whole-skinned fruits, vegetables, whole grains, and legumes, it was found that low-fiber diet patterns, which include processed meat, pizza, noodles, and other major fast foods, raise the risk of obesity by 30%. (Shin et al., 2014). On the other hand, dietary fiber has long been connected to the prevention of obesity and its associated comorbidities (Reynolds et al., 2019).

## **Methods**

A group of obese children and adolescents aged 6-15 were followed up at diabetes, endocrine, and metabolism pediatric unit (DEMPU) and referred to the Clinical Nutrition Outpatient Clinic for dietary management at Cairo university tertiary hospital were recruited and subjected to history taking, physical examination, and review of the medical record and drugs the patients received. only patients with Exogenous obesity were included (body mass index (BMI) greater than 2 standard deviations WHO 'z' score) while patients with known endocrinal disorders or had syndromic obesity or took drugs causing overweight (e.g., steroids, androgens) were excluded. Chronological age was calculated by subtracting the examination date from the birth date. Dietary assessment through 24 h recall from all participants with an analysis of fiber according to 2nd Edition food composition tables for Egypt of National Institute of Nutrition (National Nutrition Institute, 2006). Anthropometric measurements: Weight, height, and BMI were obtained and plotted against the WHO z score using WHO Anthro (version 3.2.2, January 2011). To validate the results of the dietetic study, we compared energy intake to theoretical energy expenditure. To can compare the CHO, and fat intake between different ages and genders, the values are converted to percent of calories from CHO, fat of total calories. similarly, fiber content, and fiber density (fiber/1000 kcal) is compared to DRI of fiber intake of age and sex, and adequacy of fiber, fiber /1000 kcal were calculated.

## Statistical Analysis

Data were collected, revised, coded, and entered into the Statistical Package for Social Science (IBM SPSS) version 23. The quantitative data were presented as mean, standard deviations, and ranges when parametric and median, and inter-quartile range (IQR) when data were found non-parametric. Also, qualitative variables were presented as numbers and percentages.

## Results

The study group consisted of 41 males (55.4%) and 33 females (44.6%) with male to female ratio: 1.2:1. The mean age of participants was  $9.71 \pm 2.09$  years and  $9.64 \pm 2.31$  years in the study. It was observed that caloric intake was around 96% of the normal required for age and sex (64.19%-132.55%). Half of the calories were from carbohydrates and around 30% from fat intake. Cholesterol intake was on average 200mg while saturated fat was around 4.5%.

Table 1: Nutrition assessment of the study group.

		<b>study group</b>
		<b>No.= 74</b>
% Of actual caloric intake of required energy intake	Median (IQR)	96.99 (64.19 – 132.55)
	Range	35.95 – 389.19
% Caloric achieved by CHO intake from total caloric intake	Mean $\pm$ SD	52.08 $\pm$ 12.09
	Range	25.96 – 111.83
% Caloric achieved by fat intake from total caloric intake	Median (IQR)	29.93 (21.92 – 38.55)
	Range	8.33 – 49.62
Cholesterol (mg)	Median (IQR)	184 (130 – 350)
	Range	0 – 625
Saturated fat (gm)	Median (IQR)	4.65 (2 – 10)
	Range	0 – 22

It was observed that fiber intakes in this group of children and adolescents were far below daily recommended levels. Obese children and adolescents in the current study consumed less than 25% of their daily required intake. The percentage of the adequacy of fiber intake was only about 13.87% (11.5% – 21.68%) of the daily required intake in the study group. While fiber density (adequacy of fiber /1000kcal) was only 16.6% (11.54% – 24.46%) of daily required intake in the study group. (Table 2).

Table 2: Dietary fiber intake of study group

		<b>study group</b>
		<b>No.= 74</b>
Fiber (gm)	Median (IQR) Range	4.86 (3.3 – 6.68) 1.1 – 11.96
Percent of achieved total fiber intake from the DRI (%)	Median (IQR) Range	16.5 (12.69 – 25.44) 4.4 – 46
Fiber/1000kcal	Median (IQR) Range	2.65 (1.62 – 3.72) 0.56 – 7.42
Percent of achieved fiber /1000kcal from the DRI (%)	Median (IQR) Range	18.93 (11.54 – 26.57) 4.03 – 53.02
Fiber/carbohydrates ratio	Median (IQR) Range	0.02 (0.01 – 0.03) 0 – 0.06
Fiber /fat ratio	Median (IQR) Range	0.09 (0.06 – 0.13) 0.01 – 0.56

## Discussion

The current study's findings are in line with those of Brauchla et al. (2012), who found that dietary fiber intake levels were often less than half of the DRI. Adolescents' fiber intakes were found by Dong et al. (2018) to be substantially below the daily recommendations. Overall, adolescents ingested 10.9 g/d of total dietary fiber, 6.7 g/d of insoluble fiber, and 4.0 g/d of soluble fiber (males consumed 12.0 g/d and girls 9.9 g/d). White males consumed the greatest dietary fiber, averaging 13.2 g/d total fiber, while black females consumed the least, 8.8 g/d total fiber on average (p 0.001). The average fiber intake is below the 38 g/d and 25 g/d intake levels for adolescents, respectively. When compared to the recommended, the average intake for boys was less than one-third and for girls, it was less than half. Only two individuals ate the recommended amounts. Additionally, there were no discernible seasonal differences in the fiber consumption (p-value = 0.432). Similar findings have been achieved by other teenage and adult studies, such as Bogalusa, NHANES (National Health and Nutrition Examination Survey), and CARDIA (Coronary Artery Risk Development in Young Adults) (Storey and Anderson, 2014; Eicher-Miller et al., 2015). It was suggested that nine out of ten young people consume less fiber than recommended (Nicklas et al., 1995; Kranz et al., 2012).

## Conclusion

Fiber intake in obese children and adolescents was far below daily recommended levels. More efforts should be implicated to increase dietary fiber consumption in children, especially those suffering from obesity.

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